Category: **Health & Medical Sciences**

**Nucleic Acid Based Biosensor**

**Problem Statement**

There is a growing need for highly specific, rapid, and cost-effective biosensors for detecting pathogens, environmental toxins, or disease biomarkers. Traditional biosensors rely on protein-based recognition elements that can be challenging and expensive to re-program to detect new targets. Nucleic acid-based biosensors, made out of DNA or RNA, offer a promising alternative due to their potential to be highly specific, rapidly produced, and with high programmability. However, one challenge is the need to convert nucleic acid binding to an easily detectable signal, which is typically provided by protein enzymes or fluorescent proteins in traditional biosensors.

**Technology Overview**

This technology converts binding of a target molecule by a nucleic acid structure into a detectable light signal. The reported nucleic acid biosensors contain both a sensor domain and a reporter domain. The sensor domain binds to a target molecule, while the sensor domain binds to a fluorophore. Importantly the binding of the ligand to the sensor domain affects the fluorescence of the reporter domain. This effectively converts the presence of a target molecule into a fluorescent light signal, or a change in this signal. We also describe methods of selecting new biosensors for new targets, as well as their use to detect target ligands. Target molecules may include, but are not limited to, small molecules, ions, proteins, macromolecules.

**Applications:**

* Pathogen detection
* Environmental monitoring
* Disease diagnosis and prognosis

**Benefits:**

The nucleic acid-based biosensors can be produced through cell-free biochemical methods that are fast and inexpensive. This enables rapid prototyping of new biosensors for multiple targets. Based on the sensitivity of known nucleic acid technologies, they are expected to be highly sensitive and able to detect and report very low concentrations of targets. In addition, they are expected to be very specific, with very low false reporting even for molecules similar to the target. Finally, by using a fluorescence reporter, it offers a very good signal to noise potential. Taken together, this technology offers a platform for rapid and inexpensive biosensor development, allowing improvements in accuracy and sensitivity over existing biosensors.



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Phase of Development

TRL:3-4

Working Prototype, etc.

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